RDB1768V2 Development Board User Manual

2/27/2010
Rev.1

1 OVERVIEW

The RDB1768V2 Evaluation Board gives a solid development platform for the development of systems around the NXP LPC1768 Cortex-M3 based Microcontroller. The LPC1768 is the 'superset' part of the LPC17xx family, and therefore the RDB1768 makes an excellent development board for the whole LPC17xx family of parts.

The board allows the rapid prototyping of embedded systems through the use of the on-board peripheral interfaces and supplied example software, or by connecting external hardware to the IO pads.

1.1 LPC1768 Features

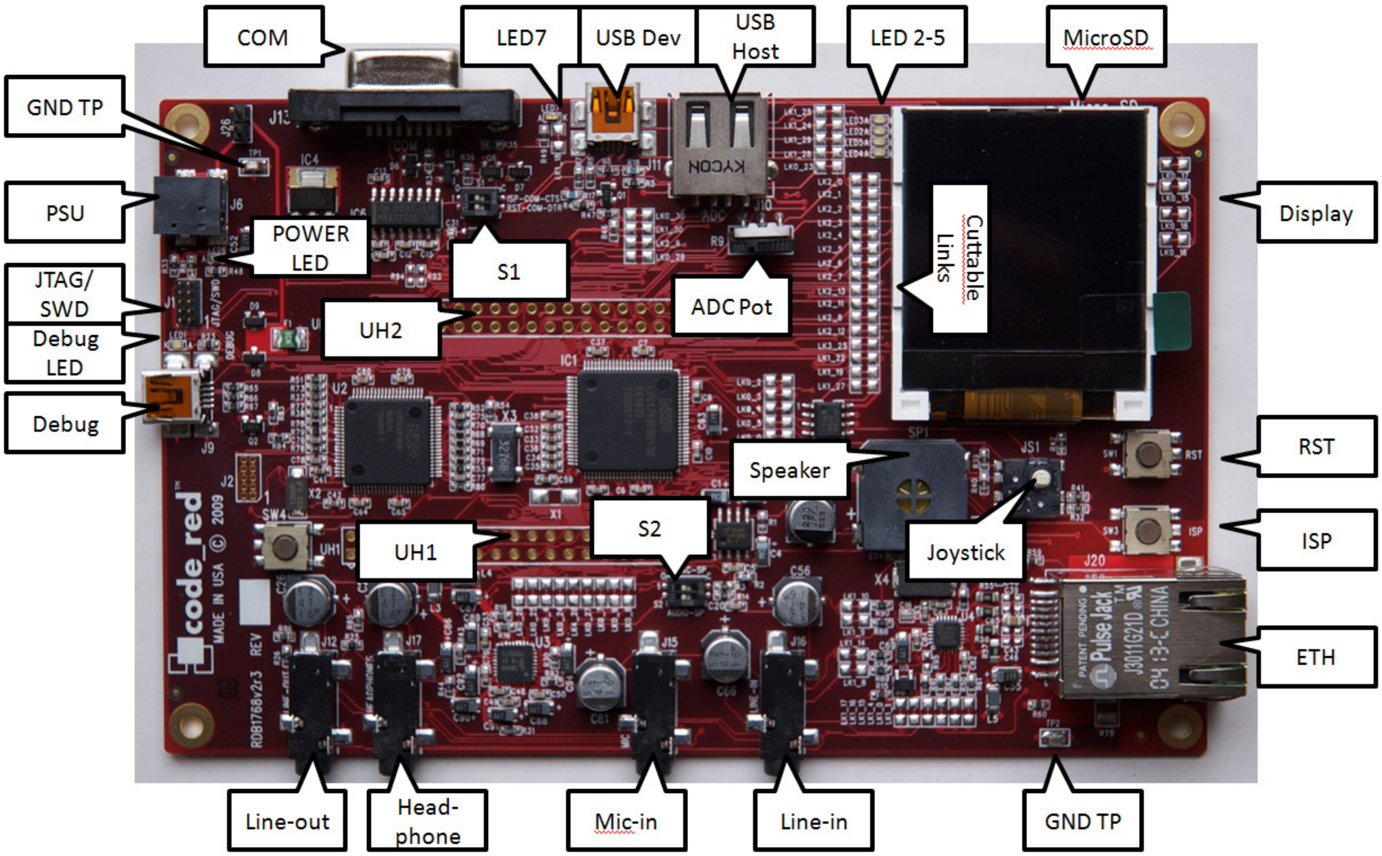
- 512K Bytes of on-chip FLASH
- 64K Bytes on-chip SRAM (in 2 banks)
- 10/100 Ethernet MAC with external PHY interface
- USB Host/Device OTG controller and PHY. USB 2 full-speed
- I2S Digital Audio interface
- 3 I2C interfaces
- 2 SSP interfaces
- 1 SPI interface
- 2 CAN interfaces
- 8-channel, 12-bit on-chip ADC
- 10-bit on-chip DAC
- PWM generation
- Quadrature Encoder Interface
- 4 GP Timers
- Ultra low-power Real-Time-Clock
- Up to 70 GPIO pins

1.2 RDB1768V2 Evaluation Board Hardware

- Drag2FLASH feature makes board appear as mass storage device for simple binary file FLASHing
- LPC1768 running at 100MHz
- 128x128 pixel color LCD display driven by GPIO port pins
- Ethernet PHY – SMSC LAN8720
- USB Device interface with standard 'Mini-B' connector
- USB Host interface with standard 'A' connector
- On-board USB debug interface (no need for a debug probe)

- UDA1380 Stereo Audio codec connected to the LPC1768 I2S port with Headphone-out, Line-out, Line-in and Mic-in connectors. UDA1380 configuration uses I2C0. Rx and Tx I2S are decoupled so different sample rates can be used.
- Micro-SD card socket wired to SSP0/SPI port
- RS232 COM port interface on UART0 of LPC1768. Can be used to program LPC1768 FLASH in In-System Programming (ISP) mode
- Switching mini-Joystick with left, right, up, down and select outputs
- On board amplifier and speaker can be driven by UDA1380 codec and/or LPC1768 DAC
- Potentiometer connected to ADC input
- 12MHz Crystal for the main LPC1768 clock (simple multiple for USB)
- 25MHz Crystal for the Ethernet PHY
- On board regulators for 3v3 derived from Debug USB Mini-B, USB Device Mini-B or Power connector
- **All on-board peripherals can be disconnected by removable links on the board. All LPC1768 IO pins brought out to pin-thro pads for connection of external peripherals. For more information see section 4.**

2 COMPONENTS



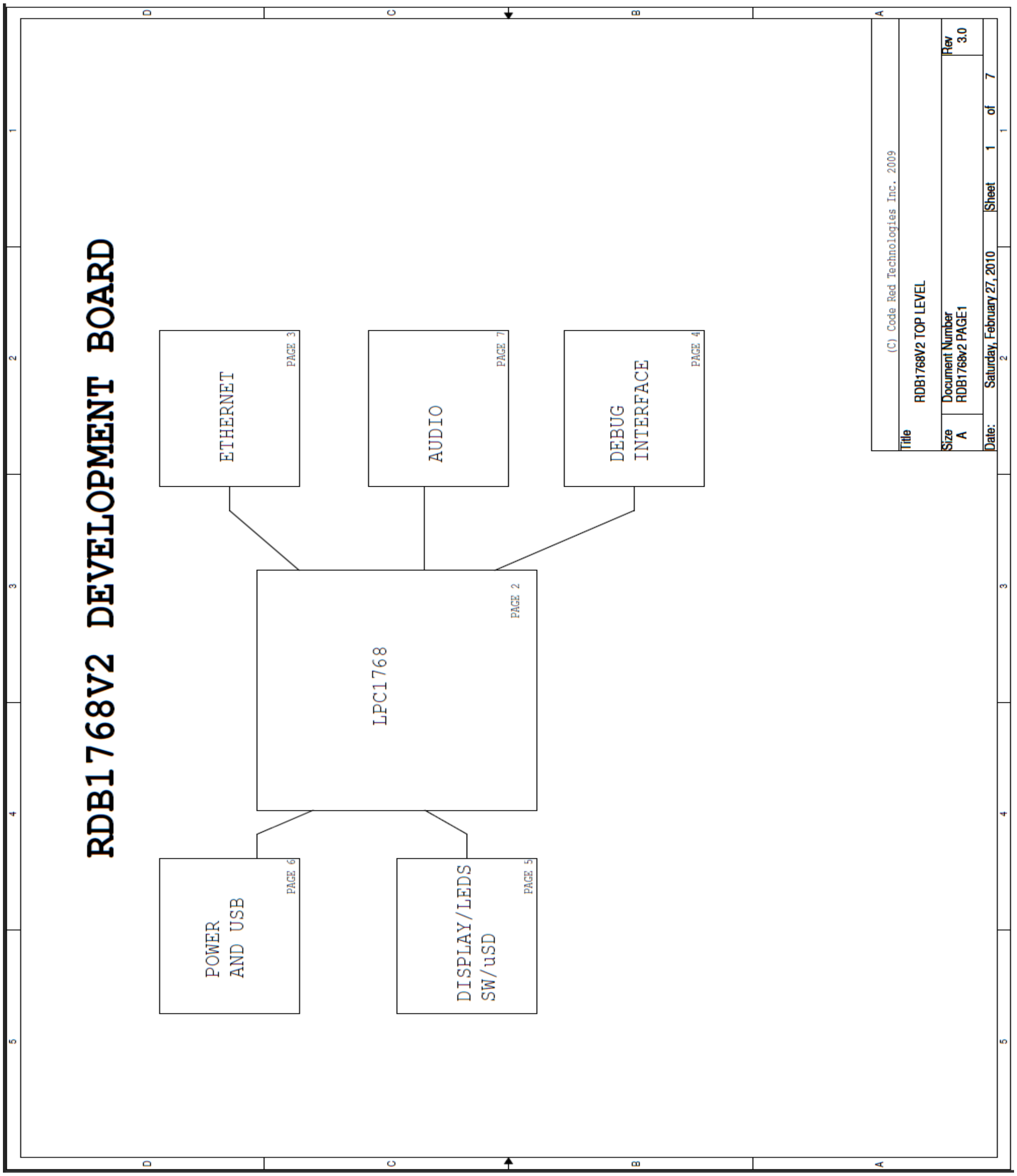
2.1 Component descriptions

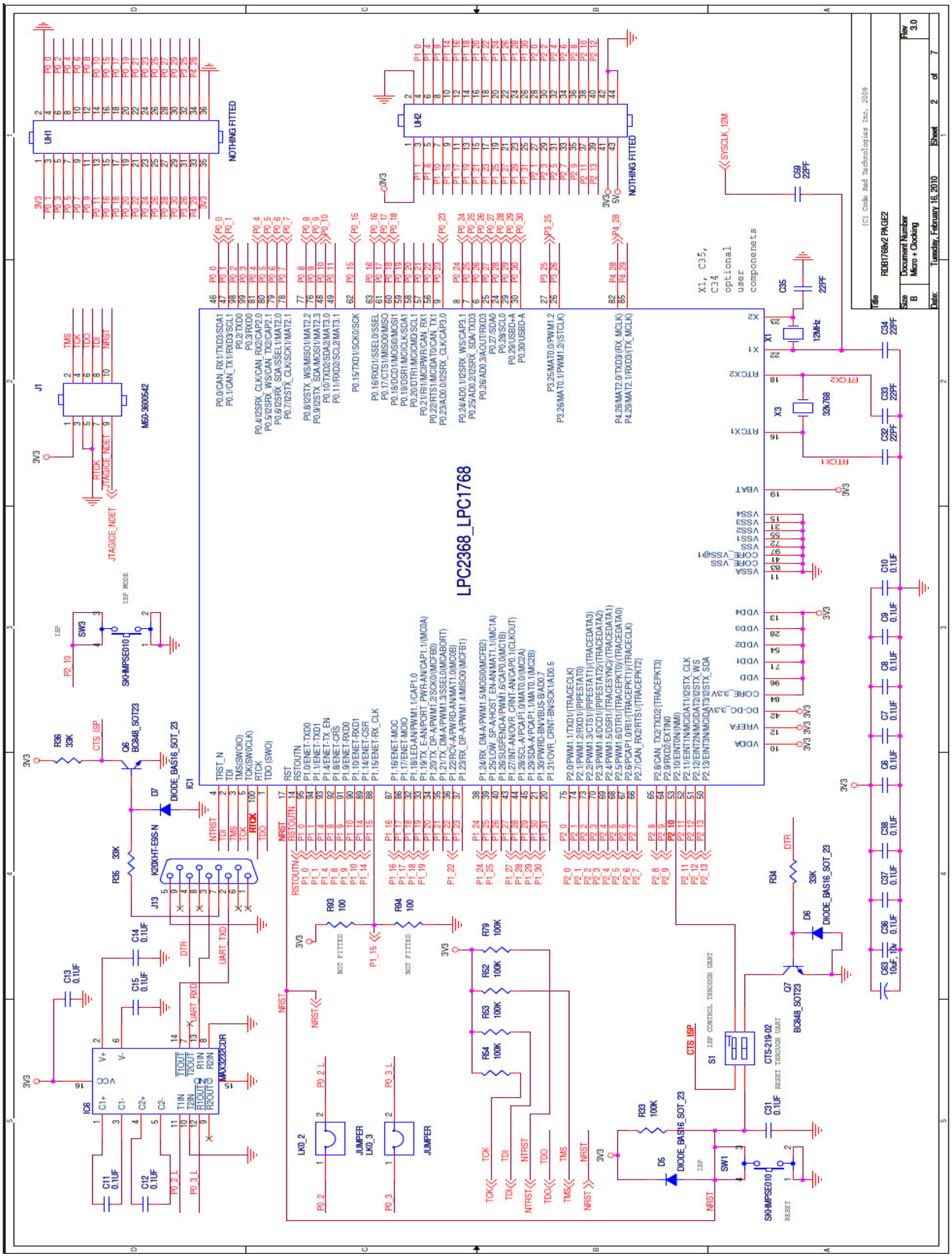
NAME	DESCRIPTION
COM	RS232 COM port connected to UART0 on the LPC2368
S1	Dual DIP switch to allow configuration of ISP through the COM port
USB Dev	USB Device Mini-B connector. Can be used to power the board.
USB Host	USB Host ‘A’ connector. Can supply power to peripherals. Is limited to 500mA, but if board is being powered from one of it’s USB device sockets then the capability will be less
LED1	LED1 indicates when an external debug probe is connected to the

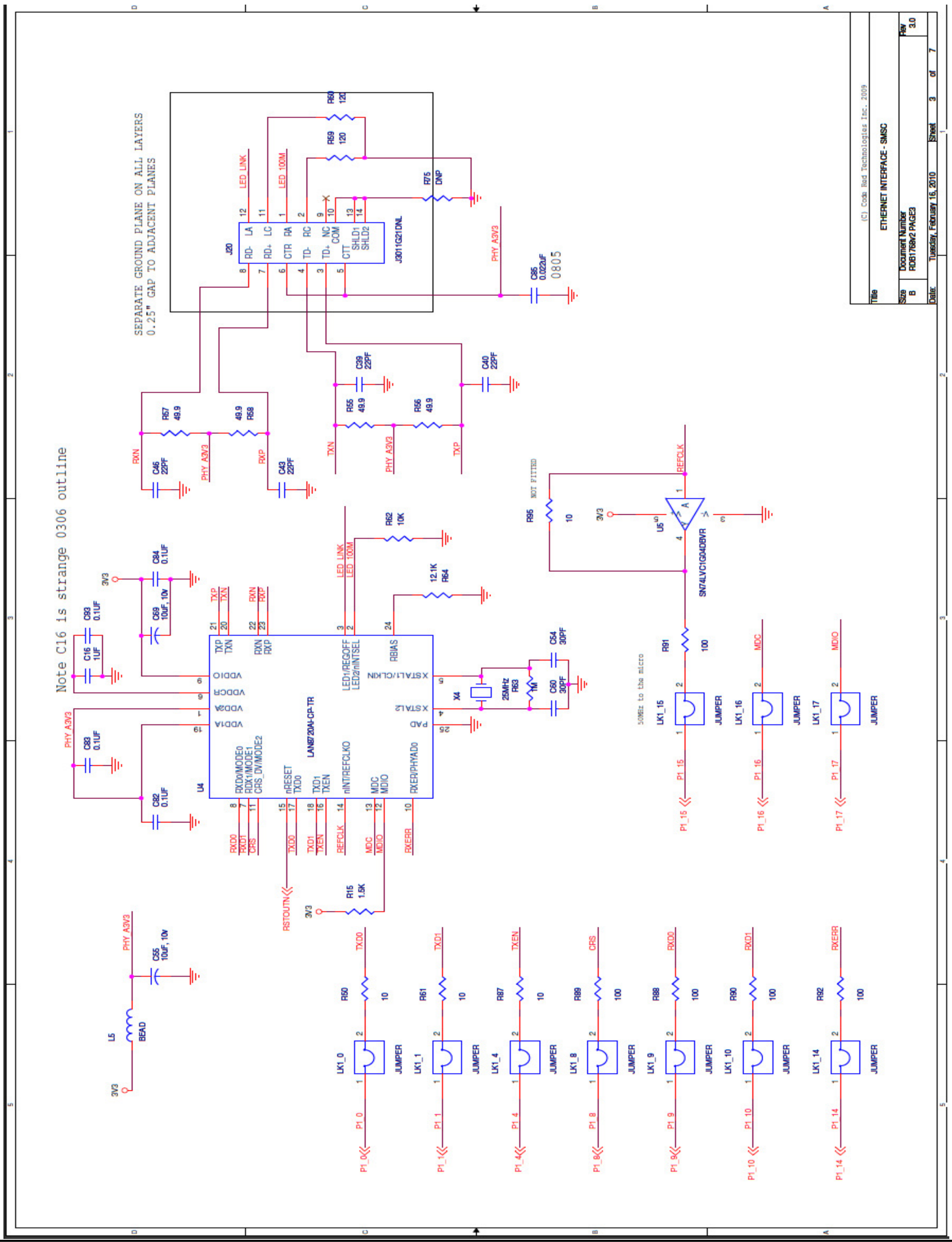
	JTAG/SWD connector
LED 2-5	User LEDS connected to P1_24, P1_25, P1_28, P1_29
NAME	**DESCRIPTION**
MicroSD	Micro-SD Card socket. Pins connect to SSI0/SPI on the LPC1768
Display	128x128 pixel color LCD display
RST	Reset button for processor
ISP	ISP button. Hold down with RST, then release RST first to enter ISP mode
ETH	The Ethernet connector
TP2	Scope probe GND post
Line-in	Stereo 3.5mm connector line level input connector to the audio codec
Mic-in	Sensitive mic input to the audio codec
S2	Dual DIP switch to select the source of audio to the speaker. Either the Codec, the DAC or a mix of both.
Headphone	Stereo 3.5mm connector for driving audio headphones
Line-out	Stereo 3.5mm line-level output from the audio codec
Debug	USB Mini-B connector for use of 'on-board' debug – direct connect to PC for debug with Red Suite. Can be used to power the board.
JTAG/SWD	Standard 0.05" pitch 2x5 pin JTAG/SWD connector for use of external debug probe such as Red Probe
PSU	External power supply connector – 5V D.C. regulated
TP1	Scope probe GND post
LED6	The power-on LED
LED7	USB device 'Goodlink' LED
UH1, UH2	User Headers with all IO pins
Speaker	Speaker driven from either on-chip DAC, or audio codec. Source is selected by S2.
Joystick	4-way + select, switch style joystick
ADC Pot	Potentiometer connected to Analogue to Digital Convertor (ADC) of LPC1768

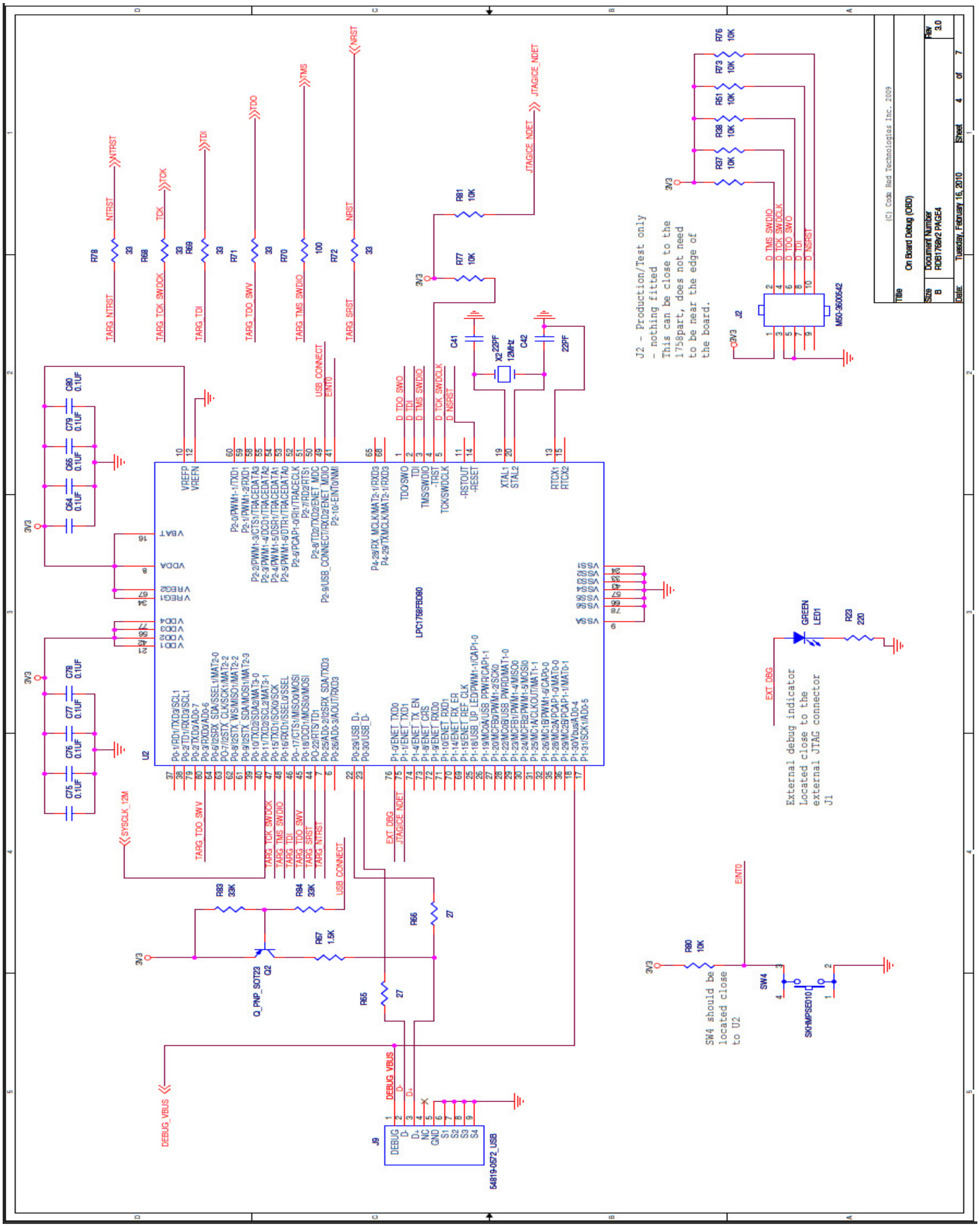
3 HARDWARE

3.1 Schematics

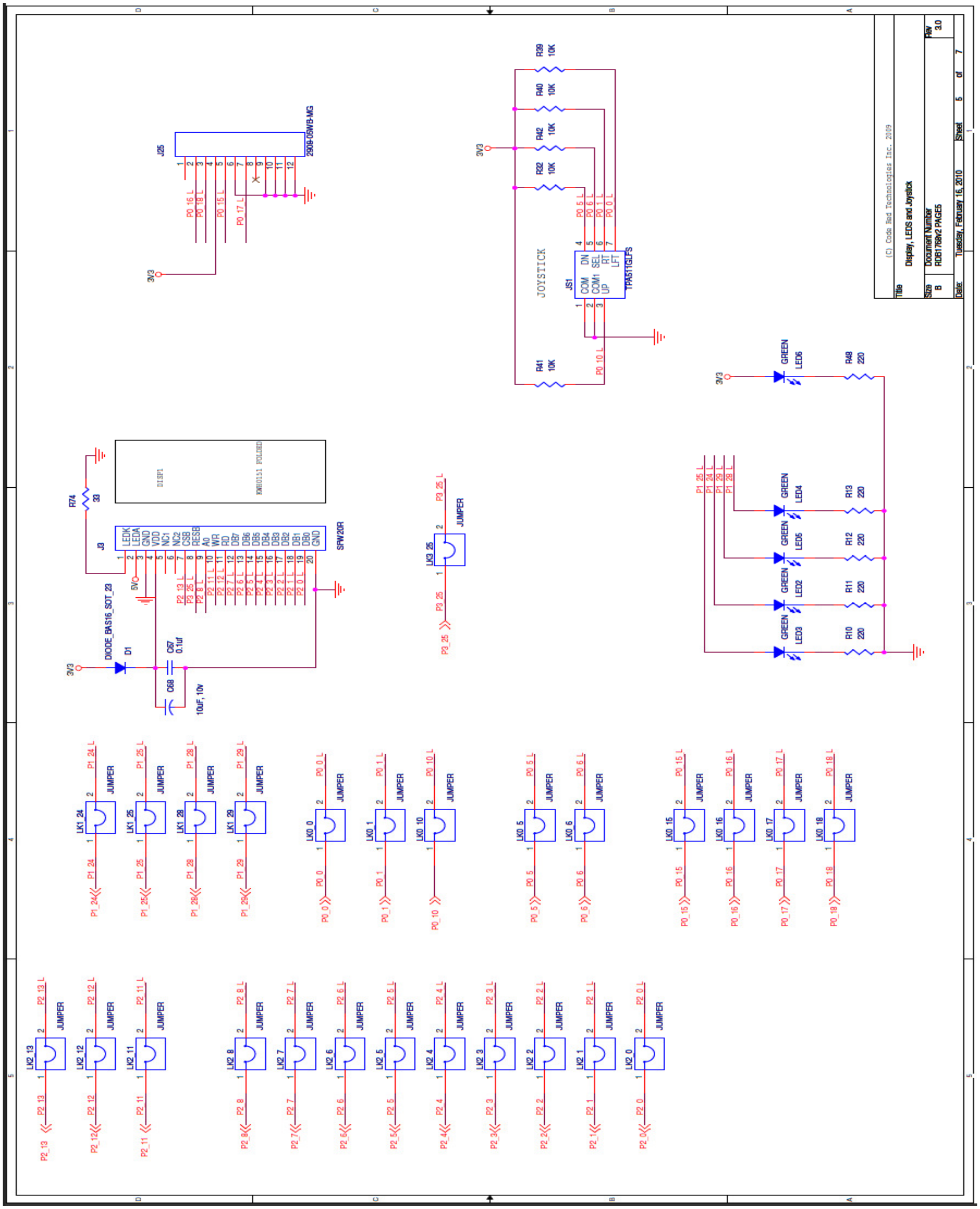


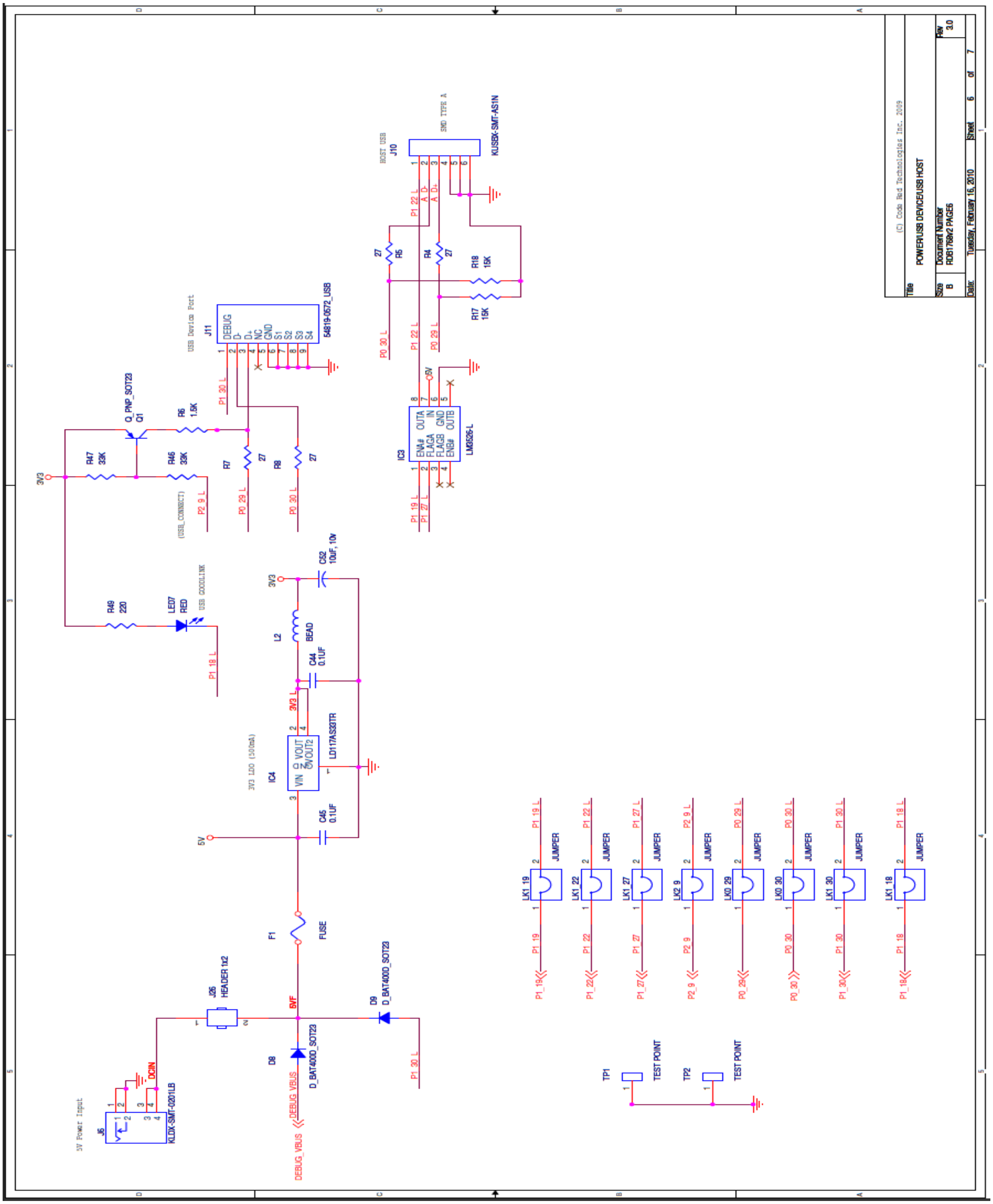

LPC2368_LPC1768
RDB1768v2 PAGE2
Micro + Clocking
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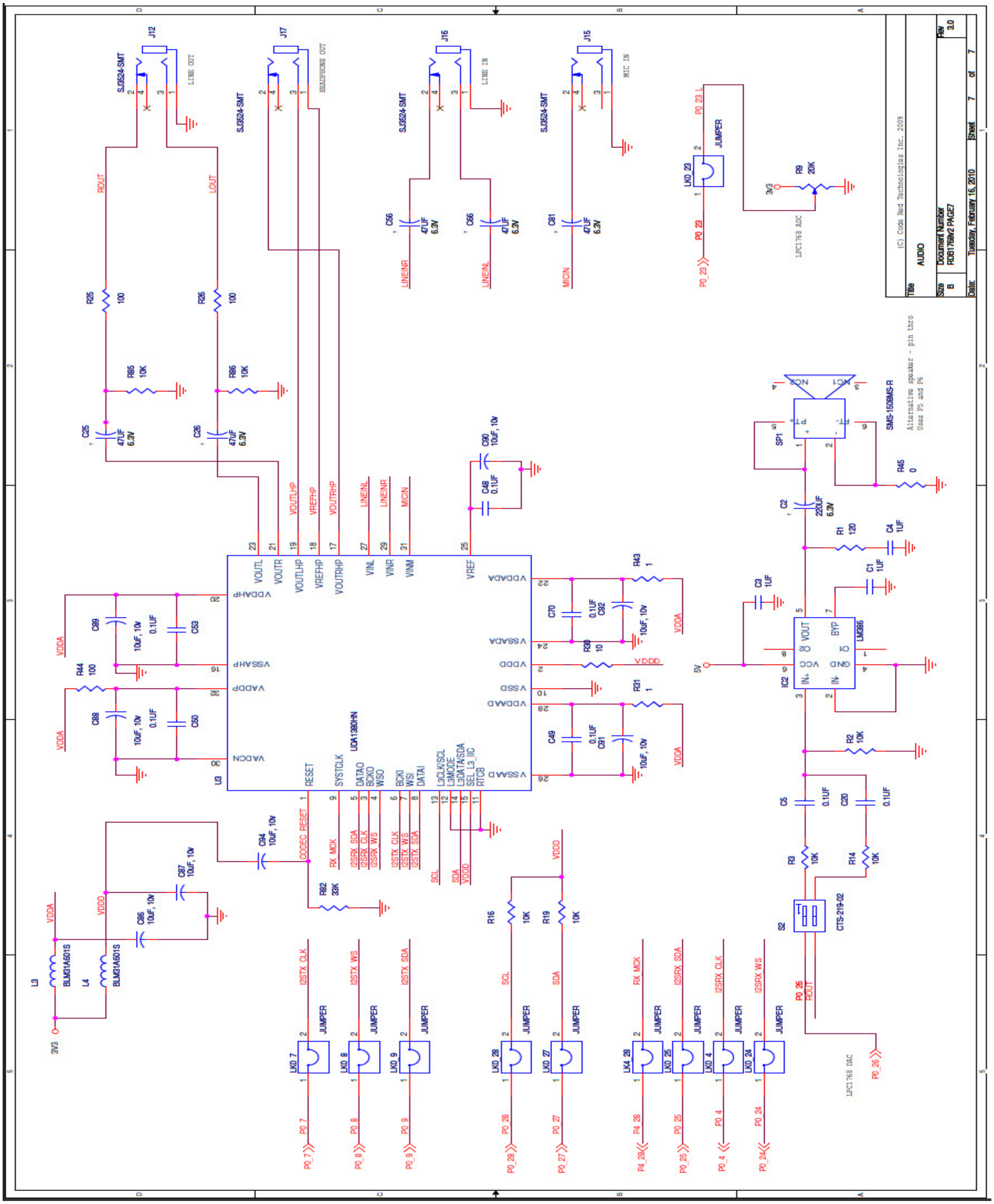

Note C16 is strange 0306 outline
SEPARATE GROUND PLANE ON ALL LAYERS
0.25" GAP TO ADJACENT PLANES
ETHERNET INTERFACE - SMSC
LAN8720AI-CP-TR
J3011G21DNL
SN74LVC1G04DBVR



LPC1758FBD80
J2 - Production/Test only - nothing fitted This can be close to the 1758part, does not need to be near the edge of the board.
External debug indicator Located close to the external JTAG connector J1
SW4 should be located close to U2
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On Board Debug (OBD)
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POWER/USB DEVICE/USB HOST
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3.0
USB Device Port
HOST USB
3V3 LDO (500mA)
5V Power Input
LD1117AS33TR
LM3526-L
KUSBX-SMT-AS1N
54819-0572_USB
TEST POINT
JUMPER



AUDIO
UDA1380HN
LM386
SJ3524-SMT
LINE OUT
HEADPHONE OUT
LINE IN
MIC IN
JUMPER
LPC1768 ADC
LPC1768 DAC
CTS-219-02
SMS-1508MS-R
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3.2 Mapping of peripherals to LPC1768 IO pins

Port	Bit	MODE	Usage	PERIPHERAL	COMMENTS
0	0	GPIO	joystick left	JOYSTICK	
0	1	GPIO	joystick right	JOYSTICK	
0	2	UART	UART_TXD	COM	
0	3	UART	UART_RXD	COM	
0	4	GPIO	joystick up	JOYSTICK	
0	5	GPIO	joystick down	JOYSTICK	
0	6	GPIO	joystick click	JOYSTICK	
0	7	I2S	I2STX_CLK	AUDIO	
0	8	I2S	I2STX_WS	AUDIO	
0	9	I2S	I2STX_SDA	AUDIO	
0	10	GPIO	CODEC_RESET	AUDIO	
0	15	SPI	sd_sck	SD	
0	16	SPI	sd_cs	SD	
0	17	SPI	sd_do	SD	
0	18	SPI	sd_di	SD	
0	23	ADC	POTENTIOMETER	POT	
0	25	I2S	I2SRX_SDA	AUDIO	
0	26	DAC	DACOUT	AUDIO	
0	27	I2C	SDA	AUDIO	
0	28	I2C	SCL	AUDIO	
0	29	USB	USB DEVICE D+	USB	
0	30	USB	USB DEVICE D-	USB	
1	0	ETH	txd_0	ETHERNET	
1	1	ETH	txd_1	ETHERNET	
1	4	ETH	tx_en	ETHERNET	
1	8	ETH	CRS	ETHERNET	
1	9	ETH	RXD_0	ETHERNET	
1	10	ETH	rxd_1	ETHERNET	
1	14	ETH	rx_er	ETHERNET	
1	16	ETH	mdc	ETHERNET	
1	17	ETH	mdio	ETHERNET	
1	18	USB	USB GOODLINK LED	USB	
1	19	USB	usb_port_pwr	USB	USB HOST POWER ENABLE
1	22	USB	usb_ppwrd#	USB	
1	24	GPIO	LED2 (USER)	LED	
1	25	GPIO	LED3 (USER)	LED	
1	27	USB	usb_ovrcr	USB	Overcurrent detect on the USB HOST
1	28	GPIO	LED4 (USER)	LED	
1	29	GPIO	LED5 (USER)	LED	
1	30	USB	USBDEV VBUS	USB	Detect VBUS
2	0	GPIO	db0	display	PIN 19 of ST7637 display controller
2	1	GPIO	db1	display	PIN 18 of ST7637 display controller
2	2	GPIO	db2	display	PIN 17 of ST7637 display controller
2	3	GPIO	db3	display	PIN 16 of ST7637 display controller

PORT	BIT	MODE	USAGE	PERIPHERAL	COMMENTS
2	4	GPIO	db4	display	PIN 15 of ST7637 display controller
2	5	GPIO	db5	display	PIN 14 of ST7637 display controller
2	6	GPIO	db6	display	PIN 13 of ST7637 display controller
2	7	GPIO	db7	display	PIN 12 of ST7637 display controller
2	8	GPIO	A0	display	PIN 9 of ST7637 display controller
2	9	USB	USB CONNECT	USB	
2	10		ISP BOOT	ISP BOOT	
2	11	GPIO	WR	display	PIN 10 of ST7637 display controller
2	12	GPIO	RD	display	PIN 11 of ST7637 display controller
2	13	GPIO	CSB (chip select)	display	PIN 7 of ST7637 display controller
3	25	GPIO	RESB (reset)	display	PIN 8 of ST7637 display controller
4	28	GPIO	TX_MCLK	AUDIO	

4 IO PADS FOR EXTERNAL CONNECTION

On the RDB1768, all of the peripherals on the board can be electrically isolated from the LPC1768 through the removal of links on the board. These are all labelled on the board. For example if the link labelled 'LK2_0' is removed, this will disconnect the display from IO pin P2_0. This will then allow the user to add any external peripheral using P2_0, connecting through the user headers UH1 and UH2.

The pinouts for user headers UH1 and UH2 can be seen on the schematics and below.

UH2 - User Header 2

GND	2	1	3.3V
P1_0	4	3	P1_1
P1_4	6	5	P1_8
P1_9	8	7	P1_10
P1_14	10	9	P1_15
P1_16	12	11	P1_17
P1_18	14	13	P1_19
P1_20	16	15	P1_21
P1_22	18	17	P1_23
P1_24	20	19	P1_25
P1_26	22	21	P1_27
P1_28	24	23	P1_29
P1_30	26	25	P1_31
P2_0	28	27	P2_1
P2_2	30	29	P2_3
P2_4	32	31	P2_5
P2_6	34	33	P2_7
P2_8	36	35	P2_9
P2_10	38	37	P2_11
P2_12	40	39	P2_12
GND	42	41	3.3V
GND	44	43	5V

UH1 - User Header 1

GND	2	1	3.3V
P0_0	4	3	P0_1
P0_2	6	5	P0_3
P0_4	8	7	P0_5
P0_6	10	9	P0_7
P0_8	12	11	P0_9
P0_10	14	13	P0_11
P0_15	16	15	P0_16
P0_17	18	17	P0_18
P0_19	20	19	P0_20
P0_21	22	21	P0_22
P0_23	24	23	P0_24
P0_25	26	25	P0_26
P0_27	28	27	P0_28
P0_29	30	29	P0_30
P3_25	32	31	P3_26
P4_28	34	33	P4_29
GND	36	35	3.3V

5 DEVELOPING AND DEBUGGING

The RDB1768 is designed to interface seamlessly with the Red Suite Development Environment from Code Red Technologies. Simply connecting a PC to the RDB1768 with the USB debug port enables Red Suite to be used as your code development and debugging environment.

The Drag2FLASH™ feature allows users to simply drag built binary files onto an Explorer window and press the button to FLASH the LPC1768 and start running the code.

The board also has a standard 10-pin 0.05" pitch JTAG/SWD connector. An external debug probe can be connected to this port for debugging. Red Probe from Code Red Technologies can be used with Red Suite 2 and connected directly to this connector. Alternatively, other debug probes and tool chains may be connected through this standard connector pin-out.

6 REFERENCES

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8. Cirrus Logic CS42L51 audio codec data sheet:
   http://www.cirrus.com/en/products/pro/detail/P1088.html